Paul J. Diodati
Director

Commonwealth of Massachusetts
Division of Marine Fisheries
251 Causeway Street, Suite 400
Boston, MA 02114
(617) 626.1520
Fax (617) 626.1509

Summary of Volunteer River Herring Counting Workshop

March 2, 2005

Concerns over the status of anadromous river herring populations have been increasing in recent years. At the same time, the related interest of organizing volunteer river herring counting projects has grown. This winter, river herring counting groups on the North Shore of Massachusetts expressed an interest in holding a meeting to discuss methodologies and future efforts. This interest resulted in a workshop held by *MarineFisheries* on February 2, 2005 to discuss the status of counting projects and to develop standardized methods for counting river herring, and analyzing and reporting the counting data. The workshop was attended by about 40 participants from all coastal areas in Massachusetts and state representatives from Connecticut and New Hampshire.

Volunteer counting groups have a difficult task obtaining a large number of daily counts from a volunteer pool during a two-month counting season. The goal of estimating run size can be challenged further by sampling designs that produce low accuracy or not having suitable counting junctions to view river herring. In preparation for the workshop, *MarineFisheries* conducted an analysis of count data to demonstrate the effects of low sample size and inadequate daily coverage on the accuracy and precision of estimates of herring run size. This analysis and the workshop deliberations allow the development of the following counting recommendations for the 2005 season.

Objectives of Volunteer River Herring Counting Projects

1. Create public awareness and stewardship for herring runs that can assist restoration.

2 Document the presence of herring runs and record seasonal, environmental and possibly indices of abundance data.

3. Produce accurate annual estimates of the size of herring runs.

4 On a regional basis, establish at least one counting series per watershed.

Two Approaches for Counting Projects

There is a clear need for better population information on river herring runs. Few rivers in Massachusetts have data series on river herring populations. It would greatly benefit the management of river herring to have at least one long-term data series in each coastal watershed. However, not all rivers have suitable counting junctions and all counting groups can't be expected to provide the coverage to estimate annual run size with statistical confidence. With this in mind, we recommend two approaches for gaining more information on river herring runs

Annual Herring Run Estimate. Higher counting accuracy can be achieved for counting groups that have a suitable counting junction and a volunteer network that can meet minimum levels of standard protocols. A structured and consistent approach to counting can provide annual estimates of run size and other population indices with statistical confidence.

Herring Run Monitoring. For situations where the counting coverage needed for run estimates will be difficult a less rigorous approach can be followed that will still provide information on the run and valuable outreach benefits. In this case, similar protocols are adopted but without the frequency to estimate run size with accuracy. This monitoring will provide information on presence/absence and run duration and may produce population indices. These efforts can be short-term, (2-3 years), followed by recommendations on restoration and further monitoring.

Recommended Counting Methods

Gary Nelson of *MarineFisheries* conducted extensive simulations on Parker River count data to evaluate the variability associated with run estimates. He examined various scenarios of coverage within a 13 hour counting day and missing days. Previous North Shore counting strategies relied on Rideout et al. (1979) that advised covering two 5 minute counts per hour (10 minutes) throughout each 13 hour counting day during the run. Gary's analysis built on this strategy and also used Jessop and Harvie (1990) as a river herring counting reference.

Two key thresholds emerged from this analysis: the percent standard error (PSE) of the run estimate and ability to detect changes in run size from year to year. A run estimate PSE of 20% or less and the ability to detect a 50% or less change in annual run size (w/ 95% confidence intervals) were determined to be reasonable thresholds for volunteer groups to achieve. These thresholds could be met by making 6-9 random counts per day throughout the run (depending on consistency of coverage). Based on past counting records, this range appears achievable by well organized counting groups with large volunteer pools. As a comparison, the counting coverage recommended by Rideout et al. (1979) was 13 counts per day (17% of available 10 minute cells). This would provide good statistical accuracy, but has proven to be difficult for volunteer groups to achieve.

Using Gary's analyses and past references, we recommend the following parameters for the two approaches. The primary difference between the two approaches is the lower counting coverage for the Run Monitoring Approach. The counting coverage for the Run Monitoring Approach is not adequate to produce annual run estimates, but will produce useful data on herring runs where we have little baseline information.

Annual Run Estimate Approach

Counting Season. April 1st to mid-June

Counting Day. 7 am to 7 pm (12 hrs.)

Counting Period. three periods (or strata) of 7-11 am, 11-3 pm, and 3-7 pm.

Counting Interval. 10 minutes per hour

Target Counting Frequency. three 10 minute cells per strata.

Counting Coverage. three samples per strata will cover 9 of 72 cells per day (12.5%). The minimum to approximate the statistical thresholds for run estimates is two samples per strata (6 of 72 cells or 8%).

Run Monitoring Approach

Use the same parameters as the Run Estimate Approach with the exception of targeting one 10 minute cell per strata. This approach is really the same as "doing the best that you can". One sample per strata covers 3 of 72 total daily cells or 4%, which will not provide a suitable level of accuracy for estimating the size of the herring run. But this coverage can show that herring are present, when the run occurs and possible produce an annual index of run size.

Flexibility

Certainly, we hope everyone can do the best that they can given the wide range of circumstances surrounding the physical nature of the different rivers and the work and home schedules of the volunteer. The goal is to adopt the above parameters as standard protocols and decide which approach is attainable for each river and counting group. The parameters that are flexible are counting season and counting frequency; more for the Run Monitoring Approach than the Run Estimate Approach. For example, June counting may not be necessary for some rivers, but rivers south of Cape Cod may need to start counting in March.

Reporting

We will send out an Excel spreadsheet that will contain standard fields for recording counting observations. This spreadsheet will receive field observation data for the entire season and will serve as a database adding consequent seasons. We will not provide field datasheets (unless requested) at this time because individual groups may have established field datasheets that serve them well. This spreadsheet will be available on our website in March.

Data Analysis

We will commit to maintaining a database for all counting data and providing technical assistance to help groups summarize their data. Over time, we hope this can evolve into an easily accessed electronic file.

Intern Assistance for Counting

The workshop produced interesting discussion on the use of interns to enhance the counting coverage of volunteer groups. A process has not been worked out for the 2005 season. All participants were encouraged to work on this concept, and to gain interns for the 2005 season and to establish intern pools with local schools and colleges for the 2006 season.

Water Temperature Monitoring

MarineFisheries will provide Onset water temperature loggers for all counting groups to record high frequency and high quality water temperature data throughout the run. Workshop discussion pointed towards continued use of spot measurements of water temperature by volunteers to maintain that sampling contact and as a back-up. Contact Matt Ayer, at 978-282-0308 x 121 for details on the loggers. We will program the loggers and retrieve the data later in the year. We will then send the data in an Excel file to each group and maintain a master file here in Gloucester.

Web Based Counting System

The workshop endorsed the development of a central web site for data entry and storage of count data. This concept has been worked on for the North Shore runs and would be beneficial to serve all groups in the state.

Future Technologies for Herring Counting

Phil Brady gave a summary of the advanced technologies available for river herring counting. Automated acoustic and video systems have been deployed and with mixed success. The workshop endorsed the concept that advanced technologies will be beneficial in some systems presently using volunteer counts. *MarineFisheries* is presently investigating video applications with the hope of developing a pilot project linked to an established volunteer counting effort.

Workshop Agenda

1. Introduction (lunch provided at 12:00)
2. Anadromous Fish Management in Massachusetts --- Mike Armstrong, *MarineFisheries*
3. Advanced Technologies in Herring Counting --- Phil Brady, *MarineFisheries*
4. Volunteer Herring Counting on the North Shore --- Tim Purinton, *Mass. Audubon*
5. Analysis of Herring Counting Data --- Gary Nelson, *MarineFisheries*

6. Workshop (1:30 - 3:30) --- Brad Chase, *MarineFisheries*: discussion on standardized methods for counting, reporting, and assessing run size and indices of population abundance.

Citations

Jessop, B.M., and C.J. Harvie. 1990. Evaluation of designs of periodic count surveys for the estimation of escapement at a fishway. North American Journal of Fish. Mgt. 10:39-45.

Rideout, S.G., J.E. Johnson, and C. F. Cole. 1979. Periodic counts for estimating the size and spawning population of alewives, *Alosa pseudoharengus* (Wilson). Estuaries 2:119-123.

Contacts

Phil Brady, 508-563-1779 x 115 for herring runs on Cape Cod and in Buzzards Bay.
Brad Chase, 978-282-0308 x111 for herring runs north of Cape Cod.